

**SHAFT SEALING DEVICE HAVING A POSITIONING RING
AND A RETAINING RING THEREOF**

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 The present invention is related to a shaft sealing device having a positioning ring and a retaining ring thereof. More particularly, the present invention is related to the shaft sealing device employing the positioning ring and the retaining ring to reinforce and simplify the entire structure that reduces manufacture cost.

10 2. Description of the Related Art

Applicant own Taiwanese patent publication No. 454827, entitled “SHAFT SEALING DEVICE FOR A ROTARY MACHINE,” discloses a shaft sealing device including a shaft tube, a positioning sleeve, a first sealing ring unit, a main body, a second sealing ring unit and a fixed sleeve.

15 Each of the first sealing ring units is essentially consisted of a rotary ring and a fixed ring. Sealing parts of the shaft sealing device of No. 454827 are successively assembled on a rotary shaft.

Another applicant own Taiwanese patent publication No. 454839, entitled “SHAFT SEALING DEVICE FOR A ROTARY MACHINE (2),”

20 also discloses a shaft sealing device including a shaft tube, a positioning

sleeve, a rotary ring, a fixed ring, a main body, a sealing ring unit and a fixed sleeve. Sealing parts of the shaft sealing device of No. 454839 are successively assembled on a rotary shaft.

However, the rotary rings and the fixed rings of the shaft sealing devices
5 of Nos. 454827 and 454839 are connected with each other by positioning pins within positioning holes that may complicate and increase manufacture cost. Since the structure of the positioning pins are weakened, the rotational movement of the shaft sealing device is not smooth.

Another applicant own Taiwanese patent publication No. 459938,
10 entitled "SECTIONAL SHAFT SEALING DEVICE FOR A ROTARY MACHINE USE," also discloses a shaft sealing device. The shaft sealing device includes a shaft tube, a first rotary ring unit, a first sealing ring unit, a main body, a second rotary ring unit and a second sealing ring unit. An end of the shaft tube and the first rotary ring unit are connected each other by at
15 least one positioning member, such as a pin.

Although the positioning member connected the end of the shaft tube with the first rotary ring of No. 459938 may increase intensity of the entire structure, it still complicates the entire structure and increases manufacture cost.

20 The present invention intends to provide a shaft sealing device having a

positioning ring and a retaining ring thereof to reinforce and simplify the entire structure that reduces manufacture cost in such a way to mitigate and overcome the above problem.

SUMMARY OF THE INVENTION

5 The primary objective of this invention is to provide a shaft sealing device having a positioning ring and a retaining ring thereof. The positioning ring and the retaining ring may commonly intensify the entire structure of the shaft sealing device.

 The secondary objective of this invention is to provide a shaft sealing
10 device having a positioning ring and a retaining ring thereof which are simplified so that parts of the shaft sealing device is reduced.

 The shaft sealing device in accordance with the present invention includes a shaft tube, a main body, a fixed sealing ring, a positioning ring and a retaining ring. The shaft tube is provided with a first end having an
15 outer flange and a rotary ring mounted thereto. And the shaft tube is further provided with a second end mechanically connected with a stop ring. The main body has an axial hole for supporting the shaft tube which is rotatably extended therethrough, and a plurality of passages for supplying and cycling fluid. The fixed sealing ring and the retaining ring are inserted in the axial
20 hole of the main body while the positioning ring being mounted in the axial

hole. The fixed sealing ring, the retaining ring and the positioning ring are disposed on the shaft tube in loose fit manner to allow for rotation. The fixed sealing ring has a first side to abut against the rotary ring mounted to the outer flange, and a second side to connect to the retaining ring. The retaining ring is located between the fixed sealing ring and the positioning ring. The positioning ring is provided with a plurality of elastic members adapted to bias the retaining ring against the fixed sealing ring so that rotational movement of the fixed sealing ring can be avoided.

Other objectives, advantages and novel features of the invention will become more apparent from the following detailed description and the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described in detail with reference to the accompanying drawings herein:

FIG. 1 is an exploded perspective view of a shaft sealing device having a positioning ring and a retaining ring in accordance with a preferred embodiment of the present invention;

FIG. 2 is a cross-sectional view, taken along line A-A in FIG. 4, of the shaft sealing device in accordance with the preferred embodiment of the present invention;

FIG. 3 is a cross-sectional view, taken along line B-B in FIG. 4, of the shaft sealing device in accordance with the preferred embodiment of the present invention; and

FIG. 4 is cross-sectional view, taken along line C-C in FIG. 3, of the shaft sealing device in accordance with the preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring initially to FIG. 1, a shaft sealing device in accordance with the preferred embodiment of the present invention includes a shaft tube 1, a main body 2, a fixed sealing ring 3, a positioning ring 4 and a retaining ring 5.

Turning now to FIG. 2, the shaft tube 1, the main body 2, the fixed sealing ring 3, the positioning ring 4 and the retaining ring 5 of the shaft sealing device are successively assembled on a rotary shaft (not labeled) to constitute a rotary mechanism.

Construction of the shaft tube 1 shall be described in detail, referring again to FIGS. 1 and 2. The shaft tube 1 is a tubular member having a first end and a second end connected thereto. A rotary shaft is able to extend through a longitudinal hole of the shaft tube 1, and fittingly fixed therein. The first end of the shaft tube 1 is provided with an outer flange 11 and a

rotary ring 12 mounted thereto. And the second end of the shaft tube 1 is further mechanically connected with a stop ring 13 for limiting axial movement. A series of screw holes 15 are equi-spaced around the second end of the shaft tube 1. Screw members 14 are combined with the screw
5 holes 15 to mount the stop ring 13 on the second end of the shaft tube 1 and the rotary shaft.

Construction of the main body 2 shall be described in detail, referring again to FIGS. 1 and 2. The main body 2 has an axial hole 21 for supporting the shaft tube 1 which is rotatably extended therethrough, and a plurality of
10 passages 22 connected an outer peripheral surface with the axial hole 21 for supplying and cycling fluid.

Construction of the fixed sealing ring 3 shall be described in detail, referring again to FIGS. 1 and 2. The fixed sealing ring 3 is a ring member and has an outer ring 31 on its outer circumference to increase its sealing
15 effect. The fixed sealing ring 3 is inserted in the axial hole 21 of the main body 2 and thus the outer ring 31 is engaged with an inner flange (not labeled) of the main body 2. The fixed sealing ring 3 has an axial hole 32 to allow for receiving the shaft tube 1. And the fixed sealing ring 3 is disposed on the shaft tube 1 in loose fit manner to allow for rotation. The fixed
20 sealing ring 3 has a first side to abut against the rotary ring 12 mounted to

the outer flange 11, and a second side to connect to the retaining ring 5. To limit rotation, the fixed sealing ring 3 is further provided with a pair of engaging notches 33 on its end opening for positioning purpose.

Construction of the positioning ring 4 shall be described in detail, referring now to FIGS. 3 and 4. The positioning ring 4 is a ring member which is inserted in the axial hole 21 of the main body 2 and mounted thereto. A series of screw holes 41 are equi-spaced around the positioning ring 4 for screw connection to the main body 2 by screw members 42. Moreover, a series of positioning holes 43 are equi-spaced on a side wall of the positioning ring 4 which faces the retaining ring 5 with respect to an axis of the main body 2. Each of elastic members 44, such as springs, is inserted into the corresponding positioning hole 43 and has an end adapted to axially bias the retaining ring 5, as shown in FIG. 2. A pair of engaging grooves 45 is longitudinally extended on an inner periphery of the retaining ring 4 for positioning purpose.

Construction of the retaining ring 5 shall be described in detail, referring back to FIGS. 1 and 3. The retaining ring 5 is a ring member which has a first sidewall and a second sidewall opposite to the first sidewall. The retaining ring 5 is inserted in the axial hole 21 of the main body 2. A pair of first engaging members 51 projects from the first side of the retaining ring 5

and engages with the corresponding engaging notches 33 of the fixed sealing ring 3 for limiting rotation. Similarly, a pair of second engaging members 52 projects from the second side of the retaining ring 5 and engages with the corresponding engaging grooves 45 of the positioning ring 4 for limiting rotation. Preferably, each of the first engaging members 51 is longitudinally aligned with the corresponding second engaging member 52 so as to simplify the entire structure.

Referring again to FIGS. 2 and 3, the retaining ring 5 is located between the fixed sealing ring 3 and the positioning ring 4 after assembling. In rotational operation, the axial movements of the fixed sealing ring 3 and the retaining ring 5 are allowed when the elastic members 44 bias the retaining ring 5 against the fixed sealing ring 3. Accordingly, the first side of the fixed sealing ring 3 abuts against the rotary ring 12 to increase sealing effect by means of the elastic members 44. Preferably, the fixed sealing ring 3 is made of hard-wearing material which is relatively rigid and strong in rotational operation. To reduce operating temperature of the fixed sealing ring 3 it is preferable to manufacture the fixed sealing ring 3 to have as low friction characteristic as possible.

Referring again to FIG. 3, the rotational movement of the fixed sealing ring 3 can be avoided since the first engaging member 51 of the retaining

ring 5 is engaged with the engaging notch 33 of the fixed sealing ring 3. As explained above, the entire structural combination of the fixed sealing ring 3, the positioning ring 4 and the retaining ring 5 in the present invention is intensified and simplified.

- 5 Although the invention has been described in detail with reference to its presently preferred embodiment, it will be understood by one of ordinary skill in the art that various modifications can be made without departing from the spirit and the scope of the invention, as set forth in the appended claims.